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Steuben County, Indiana

Pacific Northwest Environmental Res. Lab.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

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REPORT

ON

CROOKED LAKE

STEUBEN COUNTY

INDIANA

EPA REGION V

WORKING PAPER No. 325

WITH THE COOPERATION OF THE

INDIANA STATE BOARD OF HEALTH

AND THE

INDIANA NATIONAL GUARD

MARCH, 1976

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning {§303(e)}, water quality criteria/standards review {§303(c)}, clean lakes {§314(a,b)}, and water quality monitoring {§106 and §305(b)} activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Indiana State Board of Health for professional involvement, to the Indiana National Guard for conducting the tributary sampling phase of the Survey, and to those Indiana wastewater treatment plant operators who provided effluent samples and flow data.

The staff of the Division of Water Pollution Control, Indiana State Board of Health, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

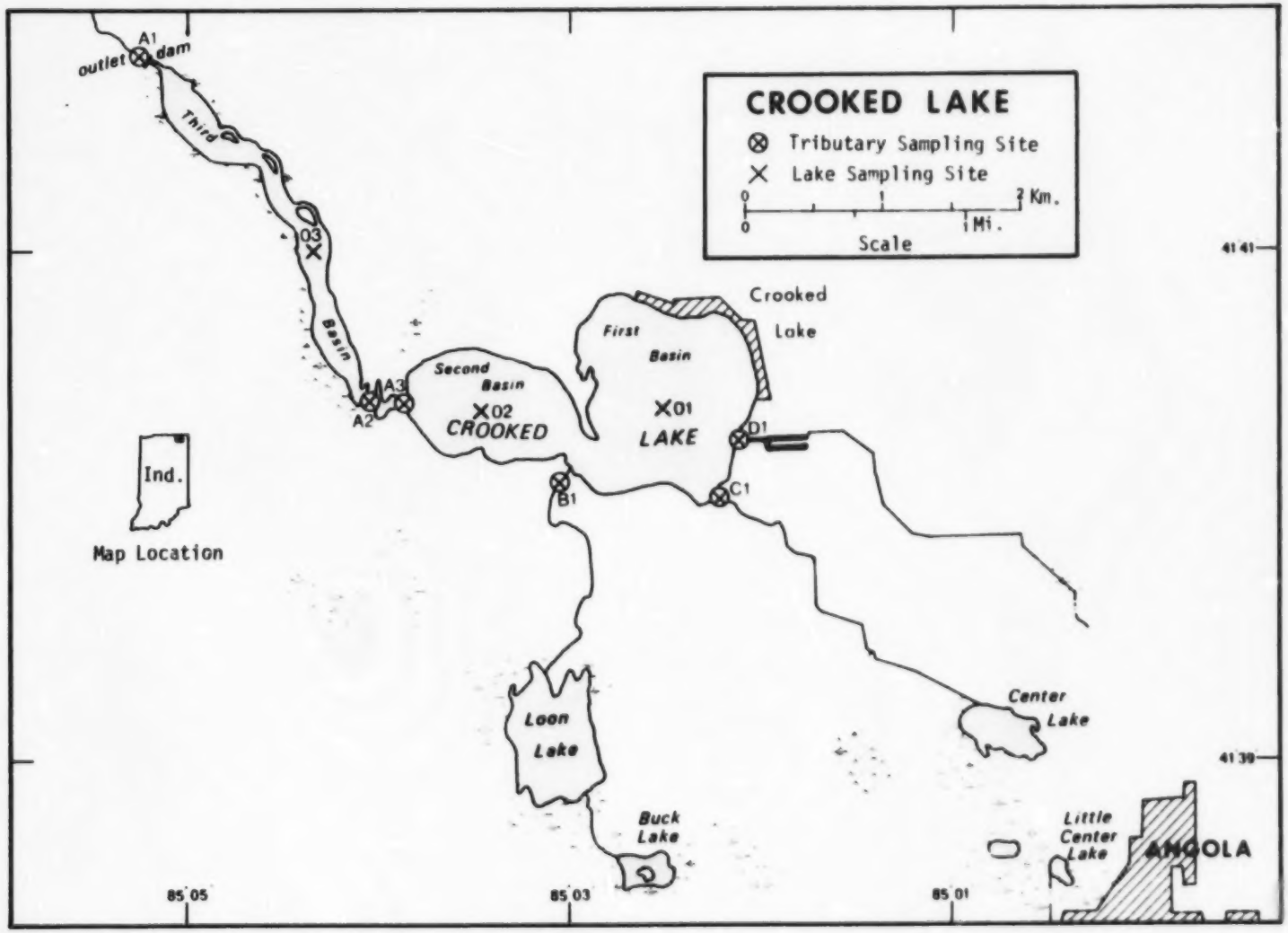
Major General Alfred F. Ahner, Adjutant General of Indiana, and Project Officers Lt. Colonel Charles B. Roberts (Retired) and Colonel Robert L. Sharp, who directed the volunteer efforts of the Indiana National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF INDIANA

LAKE NAME	COUNTY
Bass	Starke
Cataract	Owen, Putnam
Crooked	Steuben
Dallas	LaGrange
Geist	Hamilton, Marion
Hamilton	Steuben
Hovey	Posey
James	Kosciusko
James	Steuben
Long	Steuben
Marsh	Steuben
Mississinewa	Grant, Miami, Wabash
Maxinkuckee	Marshall
Monroe	Brown, Monroe
Morse	Hamilton
Olin	LaGrange
Oliver	LaGrange
Pigeon	Steuben
Sylvan	Noble
Tippecanoe	Kosciusko
Versailles	Ripley
Wawassee	Kosciusko
Webster	Kosciusko
Westler	LaGrange
Whitewater	Union
Winona	Kosciusko
Witmer	LaGrange


CROOKED LAKE
Tributary Sampling Site
Lake Sampling Site
0 1 2 Km.
0 1 Mi.
Scale
A1
outlet
dam
Third
Basin
03
A3
A2
Second
Basin
02
CROOKED
LAKE
01
First
Basin
Crooked
Lake
D1
C1
B1
Ind.
Map Location
Loon
Lake
Buck
Lake
Center
Lake
Little
Center
Lake
ANGOLA
41 41
41 39
85 05
85 03
85 01

CROOKED LAKE

STORET NO. 1852

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Crooked Lake is meso-eutrophic. It ranked seventh in overall trophic quality when the 27 Indiana lakes sampled in 1973 were compared using a combination of six parameters*. Four lakes had less and one had the same median total phosphorus, four had less and three had the same median dissolved phosphorus, none had less median inorganic nitrogen, five had less mean chlorophyll a, and six had greater mean Secchi disc transparency. Depletion of dissolved oxygen with depth occurred at sampling station 2 in August and October.

Survey limnologists reported a moderate algal bloom in August and much of the lake occupied by emergent and submerged rooted aquatic plants in August and October.

B. Rate-Limiting Nutrient:

The algal assay results indicate Crooked Lake was phosphorus limited at the time the assay sample was collected (05/02/73). The lake data indicate phosphorus limitation at all sampling times.

C. Nutrient Controllability:

1. Point sources--No known municipal or industrial wastewater treatment plants impacted Crooked Lake during the sampling year.

* See Appendix A.

Septic tanks serving lakeshore dwellings contributed an estimated 6.5% of the total phosphorus load, but a shoreline survey would be needed to determine the significance of these sources.

The non-point source phosphorus export of the Center Lake outlet was substantially higher than would be expected; and it is possible that urban drainage in the Angola metropolitan vicinity contributed to the phosphorus load in this stream via marshes near Center Lake.

The present phosphorus loading of 0.24 $g/m^2/yr$ is a little less than that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 11). Because Crooked Lake is phosphorus limited, all phosphorus inputs should be minimized to the greatest practicable degree to protect the trophic quality of this water body.

2. Non-point sources--Over 93% of the total phosphorus input to Crooked Lake was contributed by non-point sources during the sampling year. The Center Lake outlet contributed 50.0%; Unnamed Stream D-1, 14.3%; and the Loon Lake outlet, 6.5% of the total load. The ungaged tributaries were estimated to have contributed 15.6% of the total phosphorus load. As discussed above, the phosphorus export rate of the Center Lake outlet (49 kg/km^2) was significantly higher than the export rates of the other tributaries in the drainage basin (see page 10). A portion of this load probably should be attributed to point sources.

TECHNICAL REPORT DATA *(Please read Instructions on the reverse before completing)*		
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4. TITLE AND SUBTITLE Report on Crooked Lake Steuben County, Indiana		5. REPORT DATE Prepared March, 1976 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Anonymous (National Eutrophication Survey Staff)		8. PERFORMING ORGANIZATION REPORT NO. Working Paper # 325
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15. SUPPLEMENTARY NOTES Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114		

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C
18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS *(This Report)* 20. SECURITY CLASS *(This page)*	21. NO. OF PAGES 41 pp. 22. PRICE 4 00

Form 2220-1 (9-73)

PRICES SUBJECT TO CHANGE

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 3.25 kilometers^2.
2. Mean depth: 6.1 meters.
3. Maximum depth: 23.5 meters.
4. Volume: 19.825 x 10^6 m^3.
5. Mean hydraulic retention time: 2.6 years.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Loon Lake outlet	6.3	0.06
Center Lake outlet	7.8	0.07
Unnamed Stream D-1	5.3	0.05
Minor tributaries & immediate drainage -	8.2	0.06
Totals	27.6	0.24

2. Outlet -

Unnamed Stream A-1	30.8**	0.24

C. Precipitation***:

1. Year of sampling: 111.6 centimeters.
2. Mean annual: 91.3 centimeters.

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† Table of metric conversions--Appendix B.
†† Winters, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Crooked Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from one or more depths at three stations on the lake (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 4.6 meters at station 1, 20.7 meters at station 2, and 1.5 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR CROOKED LAKE
STORET CODE 1852

PARAMETER	1ST SAMPLING (5/ 2/73) 3 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/ 4/73) 3 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/15/73) 3 SITES RANGE	MEAN	MEDIAN
TEMP (C)	8.7 - 14.3	12.5	13.5	8.8 - 25.4	19.5	23.5	7.7 - 18.1	14.4	17.4
DISS OXY (MG/L)	7.6 - 10.1	9.2	9.4	0.0 - 8.8	5.0	7.0	0.0 - 8.6	4.2	4.5
CNDCTVY (MCROMO:	650. - 700.	684.	688.	460. - 668.	594.	645.	462. - 661.	552.	584.
PH (STAND UNITS)	8.0 - 8.5	8.3	8.3	7.1 - 8.4	7.8	8.0	7.2 - 8.2	7.8	7.8
TOT ALK (MG/L)	128. - 137.	134.	135.	118. - 140.	129.	127.	125. - 174.	140.	131.
TOT P (MG/L)	0.014 - 0.021	0.017	0.016	0.013 - 0.106	0.030	0.020	0.011 - 0.141	0.041	0.029
ORTHO P (MG/L)	0.002 - 0.003	0.002	0.002	0.002 - 0.083	0.016	0.007	0.003 - 0.125	0.027	0.010
NO2+NO3 (MG/L)	0.050 - 0.140	0.079	0.060	0.040 - 0.160	0.065	0.050	0.050 - 0.140	0.075	0.060
AMMONIA (MG/L)	0.030 - 0.130	0.059	0.050	0.050 - 1.250	0.236	0.060	0.070 - 1.860	0.560	0.240
KJEL N (MG/L)	0.600 - 1.200	0.762	0.600	0.900 - 2.100	1.175	1.050	0.780 - 2.500	1.325	1.150
INORG N (MG/L)	0.080 - 0.270	0.137	0.110	0.090 - 1.380	0.301	0.115	0.120 - 1.960	0.635	0.295
TOTAL N (MG/L)	0.650 - 1.260	0.841	0.735	0.940 - 2.230	1.240	1.100	0.750 - 2.600	1.400	1.205
CHLRPYL A (UG/L)	3.3 - 6.3	5.1	5.6	5.3 - 8.7	7.2	7.5	2.3 - 5.6	4.5	5.6
SECCHI (METERS)	1.2 - 2.7	1.9	1.8	2.4 - 2.8	2.6	2.7	1.4 - 3.7	2.3	1.8

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/02/73	1. Dinobryon sp.	571
	2. Blue-green filaments	376
	3. Asterionella sp.	301
	4. Melosira sp.	286
	5. Flagellates	255
	Other genera	1,051
	Total	2,840
08/04/73	1. Synedra sp.	625
	2. Aphanizomenon sp.	509
	3. Dinobryon sp.	463
	4. Microcystis sp.	463
	5. Fragilaria sp.	440
	Other genera	1,505
	Total	4,005
10/15/73	1. Flagellates	882
	2. Cryptomonas sp.	340
	3. Fragilaria sp.	139
	4. Melosira sp.	93
	5. Schroederia sp.	62
	Other genera	341
	Total	1,795

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/02/73	1	6.3
	2	5.6
	3	3.3
08/04/73	1	8.7
	2	7.5
	3	5.3
10/15/73	1	5.6
	2	5.6
	3	2.3

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.005	0.910	1.2
0.050 P	0.055	0.910	17.7
0.050 P + 1.0 N	0.055	1.910	19.7
1.0 N	0.005	1.910	1.0

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Crooked Lake was moderate at the time the assay sample was collected. The assay results also indicate phosphorus limitation at that time. Note the lack of significant change in yield with the addition of nitrogen alone but the significant increase when orthophosphorus was added.

The lake data also indicate a phosphorus limitation at all sampling times. The mean inorganic nitrogen/orthophosphorus ratios were 19/1 or greater at all sampling times, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Indiana National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Indiana District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Although nutrient data for stations A-2 and A-3 are included in Appendix E, the three basins have been treated as a single water body.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1 and D-1 and multiplying the means by the ZZ area in km^2.

The estimated septic tank phosphorus loads were reduced by 50% because of a phosphate detergent ban in effect in Indiana since 1972.

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* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal - None

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Loon Lake outlet	50	6.5
Center Lake outlet	385	50.0
Unnamed Stream D-1	110	14.3
b. Minor tributaries & immediate drainage (non-point load) -	120	15.6
c. Known municipal STP's - None	-	-
d. Septic tanks* -	50	6.5
e. Known industrial - None	-	-
f. Direct precipitation** -	55	7.1
Total	770	100.0

2. Outputs -

Lake outlet - Unnamed Stream A-1 165

3. Net annual P accumulation - 605 kg.

* Estimate based on 329 lakeside dwellings and one camp; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Loon Lake outlet	2,150	10.2
Center Lake outlet	5,615	26.6
Unnamed Stream D-1	2,735	13.0
b. Minor tributaries & immediate drainage (non-point load) -	3,515	16.7
c. Known municipal STP's - None	-	-
d. Septic tanks* -	3,575	16.9
e. Known industrial - None	-	-
f. Direct precipitation** -	3,510	16.6
Total	21,100	100.0

2. Outputs -

Lake outlet - Unnamed Stream A-1 9,755

3. Net annual N accumulation - 11,345 kg.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Loon Lake outlet	8	341
Center Lake outlet	49	720
Unnamed Stream D-1	21	516

* Estimate based on 329 lakeside dwellings and one camp; see Working Paper No. 175.
** See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	0.24	0.19	6.5	3.5

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Crooked Lake:	
"Dangerous" (eutrophic loading)	0.30
"Permissible" (oligotrophic loading)	0.15

V. LITERATURE REVIEWED

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

Winters, John, 1975. Personal communication (lake morphometry). IN Div. Water Poll. Contr., Indianapolis.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1805	CATARACT LAKE	0.058	1.660	466.667	10.744	15.000	0.013
1811	GEIST RESERVOIR	0.074	1.080	472.500	45.950	11.600	0.009
1817	JAMES LAKE	0.024	1.030	434.000	11.533	15.000	0.008
1827	MISSISSINEWA RESERVOIR	0.107	2.400	473.444	15.778	15.000	0.029
1824	MONROE RESERVOIR	0.025	0.325	438.823	6.947	15.000	0.007
1829	MORSE RESERVOIR	0.084	3.325	473.222	56.167	15.000	0.009
1836	WAWASEE LAKE	0.012	0.210	364.500	5.000	14.600	0.003
1837	WEBSTER LAKE	0.025	0.790	431.000	11.500	15.000	0.005
1839	WHITEWATER LAKE	0.084	1.620	470.167	33.083	15.000	0.012
1840	WINONA LAKE	0.035	1.250	444.667	11.211	15.000	0.011
1841	WESTLEY LAKE	0.035	0.860	427.125	10.712	15.000	0.013
1842	WITHER LAKE	0.035	0.980	440.333	11.917	15.000	0.011
1843	LAKE MAXINKUCKEE	0.020	0.220	400.480	5.483	15.000	0.003
1844	TIPPECANOE LAKE	0.019	0.195	391.500	6.050	15.000	0.005
1845	DALLAS LAKE	0.029	0.830	413.333	10.067	15.000	0.014
1846	OLIN LAKE	0.012	1.460	403.333	4.867	14.900	0.003
1847	OLIVER LAKE	0.009	0.920	392.000	3.767	14.800	0.004
1848	SYLVAN LAKE	0.170	0.130	469.833	47.480	14.800	0.017
1849	HOVEY LAKE	0.092	1.050	489.333	84.267	7.600	0.024
1850	VERSAILLES LAKE	0.139	1.090	482.000	25.078	14.500	0.019
1851	BASS LAKE	0.040	0.250	471.375	29.367	7.000	0.012
1852	CROOKED LAKE	0.019	0.120	410.111	5.578	15.000	0.005
1853	LAKE JAMES	0.016	0.190	352.444	4.856	15.000	0.005
1854	LONG LAKE	0.204	1.920	442.667	16.100	15.000	0.150
1855	PIGEON LAKE	0.058	1.945	442.667	11.900	15.000	0.015
1856	MARSH LAKE	0.093	0.270	451.333	34.467	15.000	0.055
1857	HAMILTON LAKE	0.033	0.720	413.167	17.450	15.000	0.019

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500= MEAN SEC	MEAN CHLOPA	15= MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1805	CATARACT LAKE	37 (9)	15 (4)	31 (8)	62 (16)	35 (0)	37 (9)	217
1811	GEIST RESERVOIR	27 (7)	35 (9)	15 (4)	12 (3)	92 (24)	62 (16)	243
1817	JAMES LAKE	73 (19)	42 (11)	58 (15)	50 (13)	35 (0)	65 (17)	323
1827	MISSISSINEWA RESERVOIR	12 (3)	4 (1)	8 (2)	38 (10)	35 (0)	8 (2)	105
1828	MONROE RESERVOIR	67 (17)	69 (18)	54 (14)	73 (19)	35 (0)	69 (18)	367
1829	MOWSE RESERVOIR	23 (6)	0 (0)	12 (3)	4 (1)	35 (0)	58 (15)	132
1836	WAWASEE LAKE	94 (24)	85 (22)	96 (25)	88 (23)	85 (22)	98 (25)	546
1837	WEBSTER LAKE	67 (17)	62 (16)	62 (16)	54 (14)	35 (0)	81 (21)	361
1839	WHITEWATER LAKE	19 (5)	19 (5)	23 (6)	19 (5)	35 (0)	42 (11)	157
1840	WINONA LAKE	50 (12)	27 (7)	38 (10)	58 (15)	35 (0)	52 (13)	260
1841	WESTLER LAKE	50 (12)	54 (14)	65 (17)	65 (17)	35 (0)	37 (9)	306
1842	WITMER LAKE	50 (12)	50 (13)	50 (13)	42 (11)	35 (0)	52 (13)	279
1843	LAKE MAXINKUCKEE	77 (20)	81 (21)	85 (22)	85 (22)	35 (0)	98 (25)	461
1844	TIPPECANOE LAKE	85 (22)	88 (23)	92 (24)	77 (20)	35 (0)	85 (22)	462
1845	DALLAS LAKE	62 (16)	58 (15)	69 (18)	69 (18)	35 (0)	31 (8)	324
1846	OLIN LAKE	94 (24)	23 (6)	81 (21)	92 (24)	73 (19)	92 (24)	455
1847	OLIVER LAKE	100 (26)	46 (12)	88 (23)	100 (26)	79 (20)	88 (23)	501
1848	SYLVAN LAKE	4 (1)	96 (25)	27 (7)	8 (2)	79 (20)	23 (6)	237
1849	HOVEY LAKE	31 (8)	38 (10)	0 (0)	0 (0)	96 (25)	12 (3)	177
1850	VERSAILLES LAKE	8 (2)	31 (8)	4 (1)	27 (7)	88 (23)	15 (4)	173
1851	BASS LAKE	42 (11)	77 (20)	19 (5)	23 (6)	100 (26)	46 (12)	307
1852	CROOKED LAKE	81 (21)	100 (26)	77 (20)	81 (21)	35 (0)	75 (19)	449
1853	LAKE JAMES	88 (23)	92 (24)	100 (26)	96 (25)	35 (0)	75 (19)	486
1854	LONG LAKE	0 (0)	12 (3)	44 (11)	35 (9)	35 (0)	0 (0)	126
1855	PIGEON LAKE	37 (9)	8 (2)	44 (11)	46 (12)	35 (0)	27 (7)	197
1856	MARSH LAKE	15 (4)	73 (19)	35 (9)	15 (4)	35 (0)	4 (1)	177
1857	HAMILTON LAKE	58 (15)	65 (17)	73 (19)	31 (8)	35 (0)	19 (5)	281

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1836	WAWASEE LAKE	546
2	1847	OLIVER LAKE	501
3	1853	LAKE JAMES	486
4	1844	TIPPECANOE LAKE	462
5	1843	LAKE MAXINKUCKEE	461
6	1846	OLIN LAKE	455
7	1852	CROOKED LAKE	449
8	1828	MONROE RESERVOIR	367
9	1837	WEBSTER LAKE	361
10	1845	DALLAS LAKE	324
11	1817	JAMES LAKE	323
12	1851	BASS LAKE	307
13	1841	WESTLER LAKE	306
14	1857	HAMILTON LAKE	281
15	1842	WITHER LAKE	279
16	1840	WINONA LAKE	260
17	1911	GEIST RESERVOIR	243
18	1848	SYLVAN LAKE	237
19	1805	CATARACT LAKE	217
20	1855	PIGEON LAKE	197
21	1856	MARSH LAKE	177
22	1849	HOVEY LAKE	177
23	1850	VERSAILLES LAKE	173
24	1839	WHITEWATER LAKE	157
25	1829	MORSE RESERVOIR	132
26	1854	LONG LAKE	126
27	1827	MISSISSINEWA RESERVOIR	105

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1852 CROOKED LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 30.8

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1852A1	30.8	0.362	0.442	0.631	0.589	0.377	0.289	0.173	0.057	0.057	0.059	0.150	0.283	0.288
1852A2	0.6	0.006	0.008	0.012	0.011	0.007	0.005	0.003	0.001	0.001	0.001	0.003	0.006	0.005
1852A3	4.0	0.042	0.057	0.085	0.076	0.048	0.037	0.022	0.006	0.006	0.006	0.019	0.037	0.037
1852B1	6.3	0.068	0.088	0.130	0.119	0.076	0.059	0.034	0.010	0.010	0.010	0.031	0.059	0.058
1852C1	7.8	0.088	0.110	0.161	0.150	0.093	0.074	0.042	0.012	0.013	0.013	0.037	0.074	0.072
1852D1	5.3	0.059	0.076	0.110	0.102	0.065	0.051	0.028	0.008	0.008	0.008	0.026	0.051	0.049
1852ZZ	6.3	0.068	0.088	0.130	0.119	0.076	0.059	0.034	0.010	0.010	0.010	0.031	0.059	0.058

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 30.8 TOTAL FLOW IN = 3.36
SUM OF SUB-DRAINAGE AREAS = 30.2 TOTAL FLOW OUT = 3.47

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1852A1	6	73	0.439	9	0.510				
	7	73	0.365	15	0.340				
	8	73	0.225	12	0.198				
	9	73	0.260	18	0.232				
	10	73	0.021	15	0.011				
	11	73	0.084	11	0.071				
	12	73	0.122	8	0.054				
	1	74	0.195	17	0.108				
	2	74	0.279	10	0.232	23	0.311		
	3	74	0.422	10	0.510	26	0.396		
	4	74	0.413	2	0.453				
	5	74	0.340	5	0.167				
1852A2	6	73	0.382	9	0.453				
	7	73	0.317	15	0.283				
	8	73	0.197	12	0.164				
	9	73	0.227	18	0.201				
	10	73	0.019	15	0.010				
	11	73	0.073	11	0.062				
	12	73	0.106	8	0.048				
	1	74	0.170	17	0.093				
	2	74	0.243	10	0.201	24	0.272		
	3	74	0.368	10	0.453	26	0.348		
	4	74	0.360	2	0.396				
	5	74	0.297	5	0.144				

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1852 CROOKED LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1852A3	6	73	0.374	9	0.425				
	7	73	0.311	15	0.283				
	8	73	0.192	12	0.161				
	9	73	0.222	18	0.198				
	10	73	0.018	15	0.010				
	11	73	0.071	11	0.059				
	12	73	0.104	8	0.045				
	1	74	0.166	17	0.091				
	2	74	0.238	10	0.198	24	0.266		
	3	74	0.360	10	0.425	26	0.348		
	4	74	0.351	2	0.396				
	5	74	0.289	5	0.142				
185281	6	73	0.097	9	0.108				
	7	73	0.080	15	0.074				
	8	73	0.050	12	0.042				
	9	73	0.057	18	0.0				
	10	73	0.005	15	0.0				
	11	73	0.018	11	0.0				
	12	73	0.027	8	0.012				
	1	74	0.043	17	0.024				
	2	74	0.061	10	0.051	24	0.068		
	3	74	0.093	10	0.110	26	0.088		
	4	74	0.091	2	0.102				
	5	74	0.074	5	0.037				
1852C1	6	73	0.111	9	0.136				
	7	73	0.092	15	0.093				
	8	73	0.057	12	0.051				
	9	73	0.066	18	0.062				
	10	73	0.005	15	0.004				
	11	73	0.021	11	0.018				
	12	73	0.031	8	0.016				
	1	74	0.049	17	0.027				
	2	74	0.071	10	0.062	24	0.082		
	3	74	0.107	10	0.136	26	0.105		
	4	74	0.104	2	0.119				
	5	74	0.086	5	0.048				
185201	6	73	0.076	9	0.048				
	7	73	0.063	15	0.034				
	8	73	0.039	12	0.018				
	9	73	0.045	18	0.022				
	10	73	0.004	15	0.001				
	11	73	0.014	11	0.007				
	12	73	0.021	8	0.005				
	1	74	0.034	17	0.010				
	2	74	0.048	10	0.022	24	0.028		
	3	74	0.073	10	0.048	26	0.040		
	4	74	0.071	2	0.042				
	5	74	0.059	5	0.016				

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1852 CROOKED LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1852ZZ	6	73	0.097	9	0.108				
	7	73	0.080	15	0.074				
	8	73	0.050	12	0.042				
	9	73	0.057	18	0.0				
	10	73	0.005	15	0.0				
	11	73	0.018	11	0.0				
	12	73	0.027	8	0.012				
	1	74	0.043	17	0.024				
	2	74	0.061	10	0.051	23	0.062	24	0.068
	3	74	0.093	10	0.110	26	0.088		
	4	74	0.091	2	0.102				
	5	74	0.074	5	0.037				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/03/30

185201
41 40 23.0 085 02 28.0 3
CROOKED LAKE
18151 INDIANA

083291

11EPALES 2111202
0005 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/02	10 20	0000	14.3	9.9	48	700	8.40	136	0.030	0.600	0.050	0.002
73/08/04	11 00	0000	24.7	8.1	94	663	8.40	127	0.070	1.200	0.050	0.018
	11 00	0005	24.4			660						
	11 00	0010	24.2	7.4		657	8.30	126	0.060	0.900	0.060	0.008
	11 00	0015	22.4	3.4		640	7.70	130	0.060	1.000	0.060	0.004
73/10/15	14 35	0000	17.5	8.6	54	587	8.20	125	0.110	0.800	0.060	0.005

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/02	10 20	0000	0.018	6.3
73/08/04	11 00	0000	0.026	8.7
	11 00	0010	0.016	
	11 00	0015	0.035	
73/10/15	14 35	0000	0.014	5.6

STORET RETRIEVAL DATE 76/03/30

185202
41 40 22.0 085 03 28.0 3
CROOKED LAKE
18151 INDIANA

083291

11EPALES 2111202
0054 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/02	10 45	0000	13.9		108	675	8.40	132	0.050	1.200	0.060	0.003
	10 45	0006	14.0	10.1		675	8.50	129	0.040	1.100	0.060	0.002
	10 45	0015	13.3	10.0		675	8.50	137	0.040	0.600	0.060	0.002
	10 45	0025	12.0	9.4		700	8.30	137	0.050	0.600	0.080	0.002
	10 45	0035	10.0	9.0		700	8.20	135	0.070	0.600	0.130	0.002K
	10 45	0050	8.7	8.4		700	8.00	134	0.130	0.600	0.140	0.002
73/08/04	11 40	0000	24.9	8.2	112	665	8.30	124	0.050	1.000	0.050	0.002K
	11 40	0005	24.4	8.1		655	8.30	124	0.050	0.900	0.040	0.003
	11 40	0010	24.0			650						
	11 40	0015	23.5	6.6		645	7.90	124	0.070	0.900	0.040	0.007
	11 40	0020	20.2	0.3		605	7.30	134	0.060	0.900	0.050	0.006
	11 40	0025	15.3	0.4		540	7.20	139	0.210	1.100	0.040	0.016
	11 40	0030	14.0			520						
	11 40	0040	11.2			484						
	11 40	0050	9.4	0.0		460	7.10	140	0.840	1.700	0.160	0.033
	11 40	0060	9.0			460						
	11 40	0068	8.8	0.0		460	7.20	140	1.250	2.100	0.130	0.083
73/10/15	14 50	0000	17.4	8.4	144	585	8.20	126	0.070	0.700	0.050	0.003
	14 50	0025	17.4	8.0		584	8.20	126	0.090	0.900	0.080	0.012
	14 50	0031	15.1	1.0		547	7.60	136	0.360	1.100	0.050	0.008
	14 50	0036	10.9	0.0		494	7.50	137	0.480	1.200	0.060	0.006
	14 50	0050	8.3	0.0		465	7.30	168	1.390	2.200	0.140	0.048
	14 50	0068	7.7	0.0		462	7.20	174	1.860	2.500	0.100	0.125

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

185202
41 40 22.0 085 03 28.0 3
CROOKED LAKE
18151 INDIANA
083291

11EPALES 2111202
0054 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/02	10 45	0000	0.019	5.6
	10 45	0006	0.021	
	10 45	0015	0.017	
	10 45	0025	0.016	
	10 45	0035	0.014	
	10 45	0050	0.014	
73/08/04	11 40	0000	0.013	7.5
	11 40	0005	0.017	
	11 40	0015	0.016	
	11 40	0020	0.024	
	11 40	0025	0.021	
	11 40	0050	0.043	
	11 40	0068	0.106	
73/10/15	14 50	0000	0.011	5.6
	14 50	0025	0.028	
	14 50	0031	0.030	
	14 50	0036	0.030	
	14 50	0050	0.055	
	14 50	0068	0.141	

STORET RETRIEVAL DATE 76/03/30

185203
41 41 01.0 085 04 18.0 3
CROOKED LAKE
18151 INDIANA

083291

11EPALES 2111202
0006 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/02	11 45	0000	13.8	7.6	72	650	8.30	128	0.060	0.800	0.050	0.003
73/08/04	14 15	0000	25.4	8.6	105	668	8.20	118	0.060	1.300	0.040	0.010
	14 15	0005	25.3	8.8		668	8.30	118	0.050	1.100	0.060	0.005
73/10/15	15 20	0000	17.4	8.0	72	586	8.10	126	0.120	1.200	0.060	0.012
	15 20	0005	18.1			661						

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/02	11 45	0000	0.016	3.3
73/08/04	14 15	0000	0.019	5.3
	14 15	0005	0.020	
73/10/15	15 20	0000	0.022	2.3

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/03/30

1852A1
41 41 46.0 085 05 17.0 4
UNNAMED STREAM
18 7.5 W ANGOLA
O/CROOKED LAKE 083291
DAM AT OUTLET OF THIRD BASIN
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	10	37	0.010K	0.985	0.034	0.009	0.020
73/07/15	10	47	0.012	0.900	0.048	0.006	0.015
73/08/12	09	50	0.023	0.790	0.019	0.005K	0.020
73/09/18	15	00	0.010K	0.840	0.033	0.005K	0.015
73/10/15	09	00	0.010K	0.900	0.037	0.005K	0.020
73/11/11	10	05	0.028	0.700	0.116	0.005K	0.010
73/12/08	10	45	0.064	0.700	0.092	0.008	0.015
74/01/17	09	30	0.104	1.000	0.350	0.008	0.015
74/02/23	10	40	0.132	0.800	0.185	0.005	0.015
74/03/10	09	30	0.152	0.800	0.085	0.005K	0.010
74/03/26	09	25	0.128	1.100	0.085	0.005K	0.025
74/04/02	11	20	0.104	0.900	0.040	0.005K	0.025
74/05/05	15	00	0.032	1.000	0.050	0.005	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1852A2
41 40 27.0 085 04 02.0 4
UNNAMED STREAM
18 7.5 W ANGOLA
T/CROOKED LAKE 083291
SEC HWY BRDG BETWEEN 2ND AND 3RD BASIN
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	10 55		0.011	1.400	0.029	0.005K	0.025
73/07/15	11 00		0.010K	1.100	0.034	0.005K	0.020
73/08/12	10 00		0.040	0.790	0.017	0.005K	0.015
73/09/18	18 05		0.018	0.760	0.046	0.005K	0.010
73/10/15	09 15		0.010K	0.950	0.056	0.005K	0.015
73/11/11	10 15		0.026	0.650	0.126	0.008	0.008
73/12/08	10 55		0.040	0.700	0.092	0.005K	0.015
74/01/17	09 35		0.064	0.800	0.076	0.005K	0.015
74/02/24	10 49		0.112	0.700	0.075	0.005	0.030
74/03/10	09 00		0.148	0.700	0.075	0.015	0.015
74/03/26	09 30		0.140	0.900	0.050	0.005	0.025
74/04/02	11 10		0.100	0.800	0.055	0.005K	0.020
74/05/05	13 10		0.012	0.900	0.040	0.005K	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1852A3
41 40 27.0 085 03 50.0 4
UNNAMED STREAM
18 7.5 W ANGOLA
T/CROOKED LAKE 083291
BANK SAMPLE OUTLET OF 2ND BASIN AT W END
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	11	10	0.010K	0.900	0.034	0.005K	0.015
73/07/15	11	05	0.010K	0.870	0.034	0.005K	0.015
73/08/12	10	05	0.020	1.600	0.054	0.005K	0.015
73/09/18	18	20	0.010K	0.630	0.030	0.005K	0.010
73/10/15	09	20	0.015	0.700	0.042	0.008	0.015
73/11/11	10	20	0.024	0.800	0.130	0.005K	0.010
73/12/08	11	20	0.040	0.600	0.084	0.005K	0.015
74/03/10	09	15	0.140	0.700	0.070	0.005K	0.015
74/03/26	09	35	0.148	0.800	0.045	0.005	0.020
74/04/02	11	00	0.080	0.900	0.050	0.005K	0.015
74/05/05	13	15	0.008	0.800	0.040	0.005K	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

185281
41 40 05.0 085 03 02.0 4
UNNAMED STREAM (O LOON LAKE)
18 7.5 W ANGOLA
T/CROOKED LAKE 083291
SEC HWY BRDG 1 MI N OF LOON LAKE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	11 25		0.034	1.600	0.063	0.016	0.040
73/07/15	11 52		0.069	1.200	0.052	0.017	0.030
73/08/12	10 10		0.070	0.810	0.032	0.014	0.030
74/02/24	11 00		0.184	0.900	0.155	0.005K	0.030
74/03/10	10 00		0.250	0.700	0.045	0.005K	0.010
74/03/26	09 35		0.250	0.700	0.045	0.005K	0.010
74/04/02	11 30		0.116	1.600	0.055	0.005K	0.010
74/05/05	15 20		0.040	0.900	0.025	0.020	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

18520101
41 40 02.0 085 02 41.0 4
UNNAMED STREAM (0 CENTER LAKE)
18 7.5 W ANGOLA
T/CROOKED LAKE 083291
SEC HWY BRDG JUST NE OF 4H CAMP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	09 35		0.190	3.300	0.390	0.100	0.170
73/07/15	10 00		0.240	2.100	0.270	0.079	0.125
73/08/12	09 30		0.399	1.050	0.061	0.072	0.115
73/09/18	18 45		0.800	0.920	0.048	0.054	0.065
73/10/15	09 45		0.770	1.000	0.048	0.052	0.082
73/11/11	10 42		0.760	1.150	0.094	0.040	0.080
73/12/08	10 10		0.552	0.900	0.140	0.020	0.070
74/01/17	10 00		0.420	1.500	0.370	0.148	0.250
74/02/24	10 20		0.860	1.600	0.170	0.085	0.230
74/03/10	10 30		0.630	1.900	0.280	0.125	0.250
74/03/26	09 11		0.132	2.700	0.040	0.135	0.315
74/04/02	10 50		0.232	2.500	0.165	0.105	0.198
74/05/05	14 45		0.112	1.400	0.075	0.125	0.220

STORET RETRIEVAL DATE 76/03/30

185201
41 40 16.0 085 02 05.0 4
UNNAMED STREAM (O CENTER LAKE)
18 7.5 W ANGOLA
T/CROOKED LAKE 083291
CO PARK RD BRDG .5 MI NW OF THE CO FARM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/09	10 05		0.310	1.400	0.240	0.060	0.140
73/07/15	10 05		0.220	1.400	0.110	0.025	0.080
73/08/12	09 33		0.115	1.260	0.046	0.019	0.050
73/09/18	18 50		0.315	0.840	0.068	0.014	0.065
73/10/15	09 50		0.310	0.450	0.026	0.009	0.030
73/11/11	10 45		0.460	0.300	0.042	0.008	0.035
73/12/08	10 25		0.570	0.700	0.128	0.020	0.055
74/02/10	12 40		1.730	1.700	0.055	0.025	0.060
74/03/10	10 15		1.010	1.000	0.065	0.025	0.095
74/03/26	09 06		0.690	1.300	0.065	0.025	0.085
74/04/02	10 30		0.540	1.000	0.060	0.015	0.070
74/05/05	14 50		0.336	0.500	0.020	0.015	0.070